ABSTRACT FOR GENERAL PUBLIC

Bioinspired materials science is a rewarding area of materials science research, yielding evolutionary insights into extinct and living organisms, and inspiration for biomimetic research. In particular, skeletal structures of marine organisms, including sponges, are valuable sources of novel artificially designed hybrid materials with unusual physical properties. Sponges exist on our planet during more than 500 million years. Some of them produce three dimensional skeletons made of polysaccharide chitin. From the viewpoint of applied science, chitins of sponge origin represent an intriguing scientific field aiming at the global application of such naturally pre-designed constructs as environmentally friendly bioadsorbents against diverse chemical contaminants, as scaffolding chitinous biomaterials for regenerative medicine, including tissue engineering and as ‘ready-to-use’ matrices in biomimetics and bioinspired materials science. Provided that chitins can be used in various technologies and sponges can be cultivated under marine farming conditions, these marine invertebrates have a great potential to be used as sources of unique prefabricated scaffolds. Such constructs would be further applied for the production of mechanically stable centimetre-large composites of controlled shape and size with 3D hierarchical structure in industrially relevant quantities. The discovery of nano-organized tubular chitin as the main skeletal component of marine Verongida sponges remains a milestone in the application of these organisms in marine biotechnology, biomedicine, and technology. However, there are numerous open questions regarding structure and organization of sponge chitin on nano- , micro- and macrolevel.

Thus, the goal of this innovative project is to obtain fundamental knowledge on still unknown, or poorly investigated structural, physico-chemical and materials properties of renewable naturally pre-designed 3D chitinous scaffolds of marine sponge origin. A number of analytical methods (spectroscopic methods); microscopic (scanning electron microscopy; transmission electron microscopy, atomic force microscopy) and nanoindentations proposed in the project will allow an in-depth and full understanding of the properties of the discussed biomaterials both in terms of their chemical and morphological structure, as well as assessing mutual atomic structure - porosity - mechanical properties correlations.

It is strongly believed that obtaining these data will be decisive for the correct selection of the areas of further practical application of such matrices in the most needful areas and with maximum effect.